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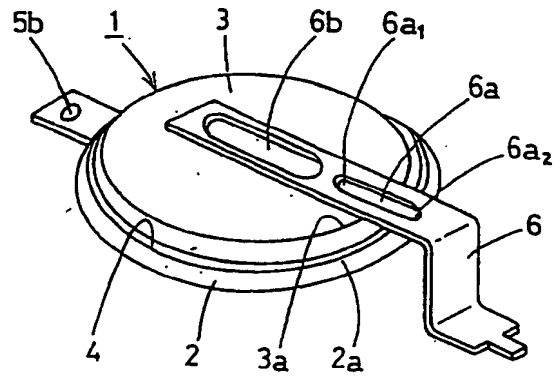
(54) **Coin type cell with lead terminals.**

(57) Short circuit between a lead terminal for a negative electrode and a positive electrode can of a coin type cell can be prevented by providing a protuberance for preventing short circuit on a part of the lead terminal for the negative electrode which part is to be positioned over an area where the lead terminal for the negative electrode and the positive electrode can are present adjacent to each other.

Fig. 4



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COIN TYPE CELL WITH LEAD TERMINALS

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a coin type cell with lead terminals.

Description of the Related Art

With development of a coin type cell having good storage properties such as a coin type lithium cell, the coin type cell is recently used as a back-up electric source for an electric device or appliance. To such coin type cell, lead terminals are beforehand attached so as to make it easy to assemble the cell in a circuit base of the electric device or appliance. In the conventional technique, as shown in Fig. 1, one end of a lead terminal 5 for a positive electrode is bonded to a positive electrode can 2, and one end of a lead terminal 6 for a negative electrode is spot welded to an upper surface of a central part of a negative electrode plate 3. The other end of each of the lead terminals 5 and 6 extends in a radial direction of a coin type cell 1 beyond an edge at which the negative electrode plate 3 and the positive electrode can 2 meet each other.

In an actual coin type cell, an opening edge 2a of the positive electrode can 2 reaches nearer to the upper surface of the negative electrode plate 3 than the distance seen in Fig. 1 which is an enlarged figure. Therefore, a load is applied on an upper side of the lead terminal 6 for the negative electrode, the lead terminal 6 is bent and contacted to a periphery of the positive electrode can 2 to form a short circuit.

To prevent the formation of short circuit through contact of the lead terminal 6 to the positive electrode can, the periphery of the electrode can 2 is covered with an insulating tube 7, a front part of which is cut away (see, for example, Japanese Utility Model Kokai Publication No. 19145/1985).

However, the covering of the periphery of the positive electrode can 2 increases a production cost of the cell and decreases productivity.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a coin type cell with lead terminals which has no insulating covering on a periphery of a positive electrode can and in which a lead terminal for a negative electrode does not contact to a positive electrode can when the lead terminal is bent with a load applied on its upper side.

According to the present invention, there is provided a coin type cell with lead terminals which comprises a positive electrode can, a negative electrode plate which is engaged with the positive electrode can, a first lead terminal attached to the positive electrode can, and a second lead terminal attached to the negative electrode plate, wherein said second lead terminal is a plate form one end of which is welded to an upper surface of a center part of said negative electrode plate, an protuberance for preventing short circuit is provided on a part of said second lead terminal which part is to be positioned over an area where the second lead terminal and the positive electrode can are present adjacent to each other, a top face of said protuberance faces the negative electrode plate, and an edge of said protuberance on the cell center side is present inside a peripheral edge of an upper surface of said negative electrode plate.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front view of a conventional coin type cell with lead terminals,

Fig. 2 is a front view of a comparative coin type cell with lead terminals,

Figs. 3 and 4 are a front view and a perspective view of a coin type cell with lead terminals according to the present invention, respectively,

Fig. 5 is a plane view of a lead terminal for a negative electrode used in the coin type cell of Figs. 3 and 4,

Fig. 6 is a cross sectional view of the lead terminal of Fig. 5 along the line A-A,
Fig. 7 is a front view of the coin type cell according to the present invention which is placed on a stand for testing short circuit between the lead terminal for the negative electrode and the positive electrode can.

DETAILED DESCRIPTION OF THE DRAWINGS

The flat electrode with the lead terminals according to the present invention will be explained by making reference to Figs. 3 to 7.

When a load is applied to the upper side of the lead terminal 6 at its outer end in the radial direction of the cell, the protuberance 6a for preventing short circuit contacts to the upper surface of the negative electrode plate 3, whereby further bending of the lead terminal 6 is prevented. That is, with the protuberance 6a for preventing short circuit, the stiffness of the lead terminal 6 is increased, and thereby the bending of the lead terminal 6 is prevented when the load is applied to the upper surface of the lead terminal 6 so that the lead terminal 6 does not contact to the periphery of the positive electrode can 2 and the formation of short circuit is prevented.

As shown is Figs. 3 and 4, the coin type cell 1 of the present invention comprises a positive electrode can 2, a negative electrode plate 3 and an insulating packing 4 which is inserted between the negative electrode plate 4 and the positive electrode 2. The coin type cell 1 further comprises a lead terminal 5 for the positive electrode and a lead terminal 6 for the negative electrode.

The lead terminal 5 for the positive electrode has a protuberance 5a at one end and is spot welded to a bottom of the positive electrode can through the protuberance 5a. The other end of the positive electrode 5 extends in the radial direction of the cell beyond the periphery of the cell and has a hole 5b.

The lead terminal 6 for the negative electrode has the protuberance 6a for preventing short circuit and a protuberance 6b for welding at one end. The protuberance 6b faces the negative electrode plate 3 and is spot welded to the upper surface of the center part of the negative electrode plate 3.

The protuberance 6a for preventing short circuit is positioned over an area where the lead terminal 6 and the positive electrode can 2 are present adjacent to each other. Its top faces the negative electrode plate 3, and its edge $6a_1$ on the cell center side is present inside a peripheral edge 3a of the upper surface of the negative electrode plate 3.

The other end of the lead terminal 6 extends in the radial direction of the cell 1 beyond the area where the lead terminal 6 and the positive electrode can are present adjacent to each other. Outside the cell region, the lead terminal 6 is bent downwardly and then horizontally on the same plane as the lead terminal 5 for the positive electrode as shown in Figs. 5 and 6.

Typically, the cell 1 has a diameter about 16 mm and a thickness of about 1.6 mm. The diameter and the thickness may be smaller or larger than the above sizes.

In general, the negative electrode is made of a lithium-aluminum alloy, and the positive electrode is made of a positive electrode composition comprising manganese dioxide as a positive electrode active material.

Usually, the positive electrode can is made of stainless steel, and the negative electrode plate is also made of stainless steel.

The insulating packing is made of a synthetic resin or rubber such as polypropylene.

The lead terminal 5 for the positive electrode is made of stainless steel.

The lead terminal 6 for the negative electrode is also made of stainless steel and has a width about 4 mm and a thickness of about 0.2 mm. The width and thickness may be smaler or larger than these sized. The protuberance 6b for welding has a height of about 0.2 mm. This height may be lower or higher than 0.2 mm according to the design of the cell.

The protuberance 6a for preventing short circuit has a height of about 0.1 mm, a length of about 3.2 mm, and a width of about 1.4 mm. These sizes may be changed according to the design of the cell.

The edge $6a_2$ of the protuberance 6a is present outside the opening edge 2a of the positive electrode can 2.

In the above embodiment of Figs. 5 and 6, the protuberances 6a and 6b are formed by pressing the negative electrode plate 2, although they may be formed by welding a mass of a metal onto the negative electrode plate 2.

Experiment

The coin type cell with the lead terminal of the present invention (Cell A) shown in Figs. 1 and 2 was place on a stand 8 as shown in Fig. 7, and a load of 10 kg was applied to the outer end of the lead terminal 6 for the negative electrode in a downward direction indicated by an arrow in Fig. 7. Then, whether short circuit was formed or not was detected.

The result is shown in Table.

For comparison, a coin type cell having the same structure as that of Fig. 1 except that no protuberance 6a was formed (Cell B) was subjected to the same test as above. The result is shown in Table.

With each type of cell, ten samples were tested, and Table shows the number of the cells in which the short circuit was formed.

Table

Cell	Number of cells in which the short circuit was formed
A	0
B	8

Claims

1. A coin type cell with lead terminals which comprises a positive electrode can, a negative electrode plate which is engaged with the positive electrode can, a first lead terminal attached to the positive electrode can, and a second lead terminal attached to the negative electrode plate, wherein said second lead terminal is a plate form one end of which is welded to an upper surface of a center part of said negative electrode plate, an protuberance for preventing short circuit is provided on a part of said second lead terminal which part is to be positioned over an area where the second lead terminal and the positive electrode can are present adjacent to each other, a top face of said protuberance faces the negative electrode plate, and an edge of said protuberance on the cell center side is present inside a peripheral edge of an upper surface of said negative electrode plate.

2. The coin type cell with lead terminals according to claim 1, wherein said lead terminal for the negative electrode is downwardly bent and then horizontally bent outside the cell region.

Fig. 1

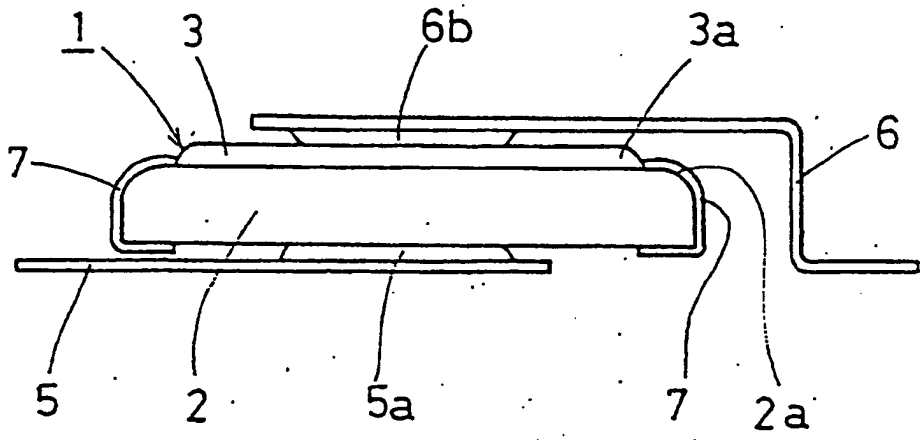


Fig. 2

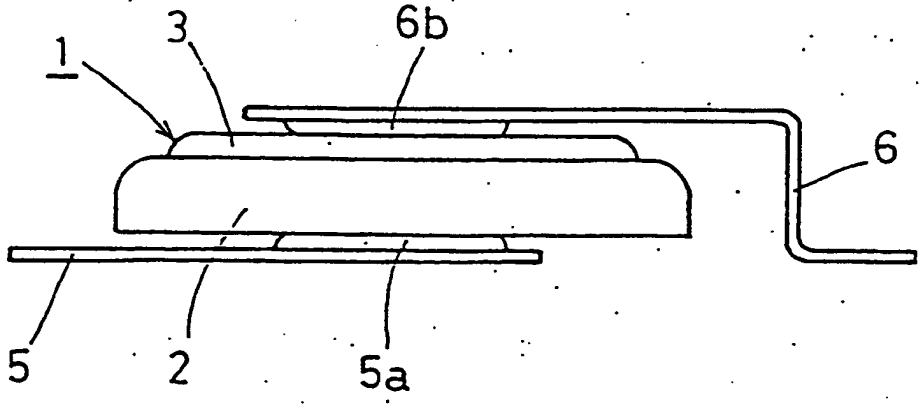


Fig. 3

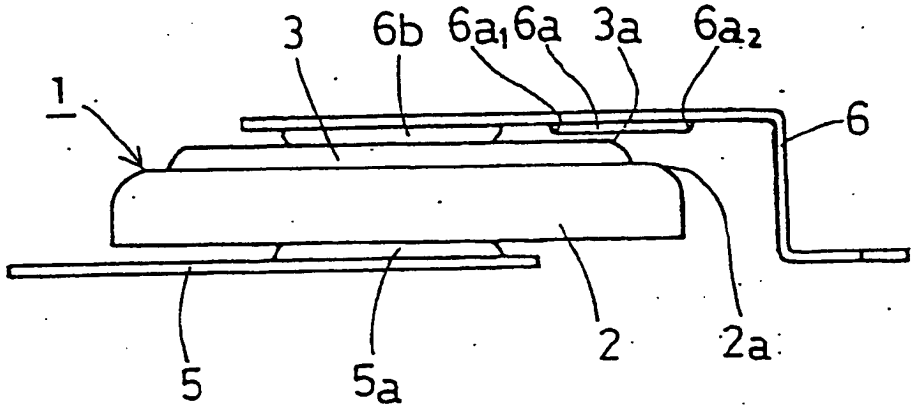


Fig. 4

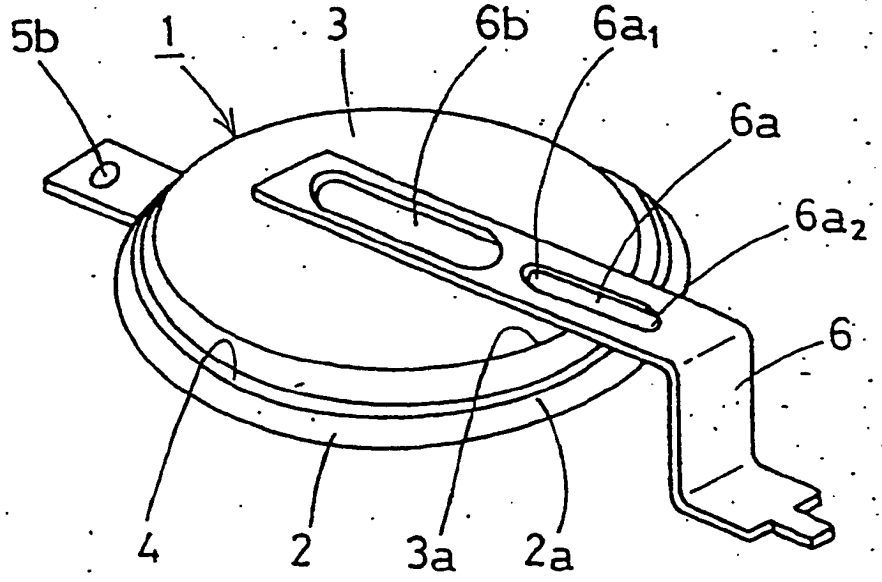


Fig. 5

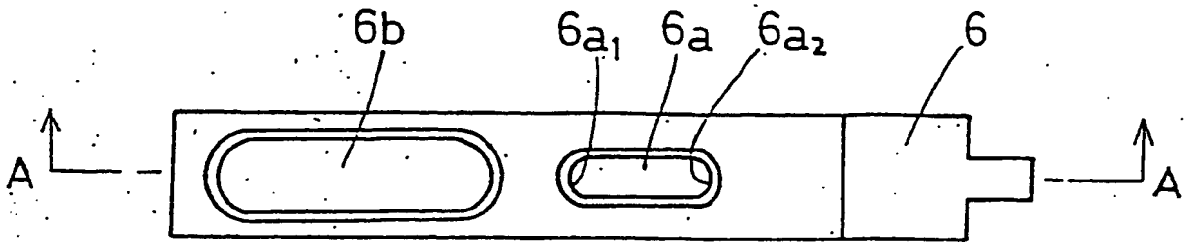


Fig. 6

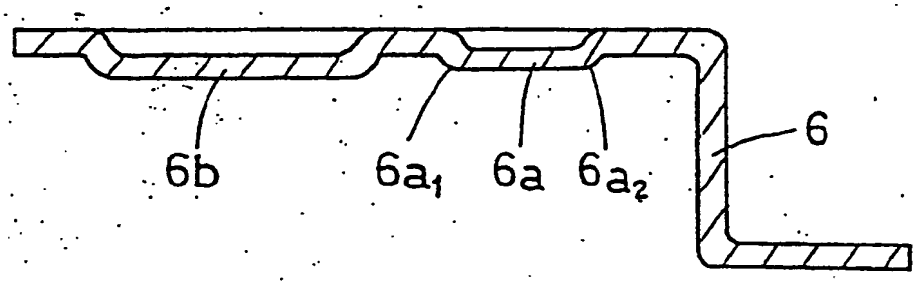
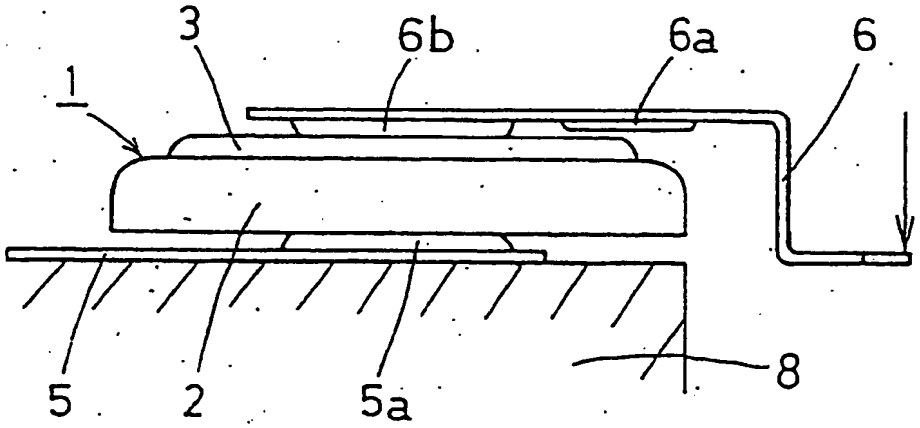


Fig. 7



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10.07.91 Bulletin 91/28

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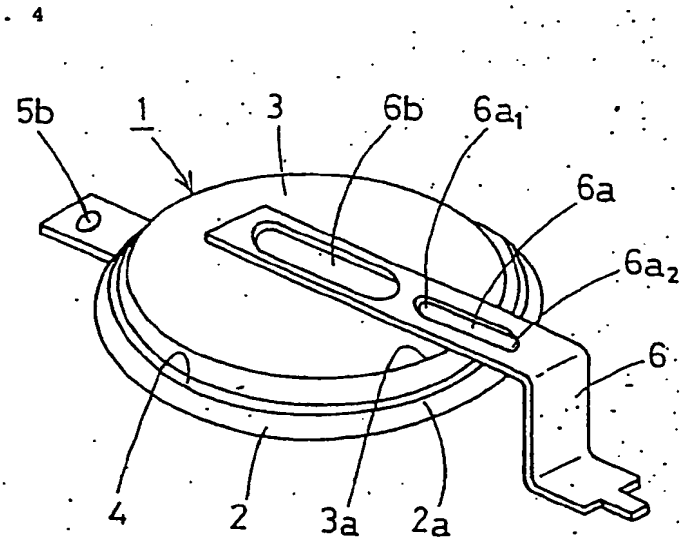
(54) Coin type cell with lead terminals.

(57) Short circuit between a lead terminal (5, 6) for a negative electrode (3) and a positive electrode can (2) of a coin type cell (1) can be prevented by providing a protuberance (6a) for preventing short circuit on a part of the lead terminal (6) for the negative electrode which part is to be positioned over an area where the lead terminal for the negative electrode and the positive electrode can (2) are present adjacent to each other.

Fig. 4



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EUROPEAN SEARCH REPORT

Application Number

EP 90 12 0062

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	PATENT ABSTRACTS OF JAPAN, vol. 11, no. 288 (E-542)[2735], 17th September 1987; & JP-A-62 88 259 (MATSUSHITA ELECTRIC IND.) 22-04-1987 * Abstract *	1	H 01 M 2/30 H 01 M 2/22 H 01 M 2/34
Y	IDEM	2	
Y	PATENT ABSTRACTS OF JAPAN, vol. 12, no. 486 (E-695)[3333], 18th December 1988; & JP-A-68 202 846 (FUJI ELECTROCHEM. CO.) 22-08-1988	2	
A	PATENT ABSTRACTS OF JAPAN, vol. 11, no. 288 (E-542)[2735], 17th September 1987; & JP-A-62 88 258 (MATSUSHITA ELECTRIC IND.) 22-04-1987		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H 01 M

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	18 April 91	D'HONDT J.W.

CATEGORY OF CITED DOCUMENTS

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